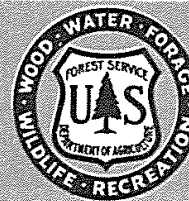


RESEARCH NOTE



CENTRAL STATES FOREST EXPERIMENT STATION
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PREMIUM YELLOW-POPLAR SEEDLINGS - 8 YEARS AFTER PLANTING

During 8 years in an old-field plantation in southeastern Ohio, premium-size poplar (Liriodendron tulipifera L.) seedlings grew much faster than shorter seedlings (not much smaller than typical planting stock from most nurseries). So using extra-large seedlings seems a promising way to increase both early growth and survival, thereby helping to solve the complex problem of establishing hardwood plantations on old fields.

The Study

Planting stock for this study was grown in the Ohio Division of Forestry nursery at Marietta from seed collected from four good stands in southeastern Ohio. Five-tree plots for each source and for each of two seedling sizes were replicated three times in a split-block design.

Run-of-the-bed seedlings were divided into two classes: top length greater than 15 inches and top length less than 10 inches; seedlings between 10 and 15 inches long were discarded. The tall seedlings probably averaged 16 to 18 inches in top length and about 1/3-inch-root-collar caliper; the short seedlings were about 5 or 6 inches long and 1/5-inch caliper (these dimensions are estimated from measurement of other seedlings in the same lot).

Seedling roots were pruned to about 8 inches before planting. The trees were planted with a mattock on an east-facing slope, part of an old field in Noble County, Ohio.^{1/} No site preparation was necessary before planting but we have

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^{1/} We thank the Ohio Power Company forestry staff for their good cooperation in establishing this study.

since cut the few invading hardwoods before they provided any competition. European black alder (Alnus glutinosa (L.) Gaertn.) seedlings were planted on the plot boundaries in 1962, seven years after planting the yellow-poplar.

Results

Seedling survival and growth during 8 years were as shown below:

<u>Seed source</u>	<u>Survival (percent)</u>		<u>Total height (feet)</u>	
	<u>Short</u>	<u>Tall</u>	<u>Short</u>	<u>Tall</u>
Marietta, Ohio	73	100	4.8	9.9
Athens, Ohio (A)	73	100	4.8	9.5
Zaleski, Ohio	93	100	5.1	9.5
Athens, Ohio (B)	93	100	5.5	9.8

Growth patterns for short and tall seedlings were similar except that the tall seedlings consistently attained a given height 3 years ahead of the short ones (fig. 1). As long as the present height growth trends continue we can expect the trees grown from tall seedlings to increase their advantage over those grown from short seedlings.

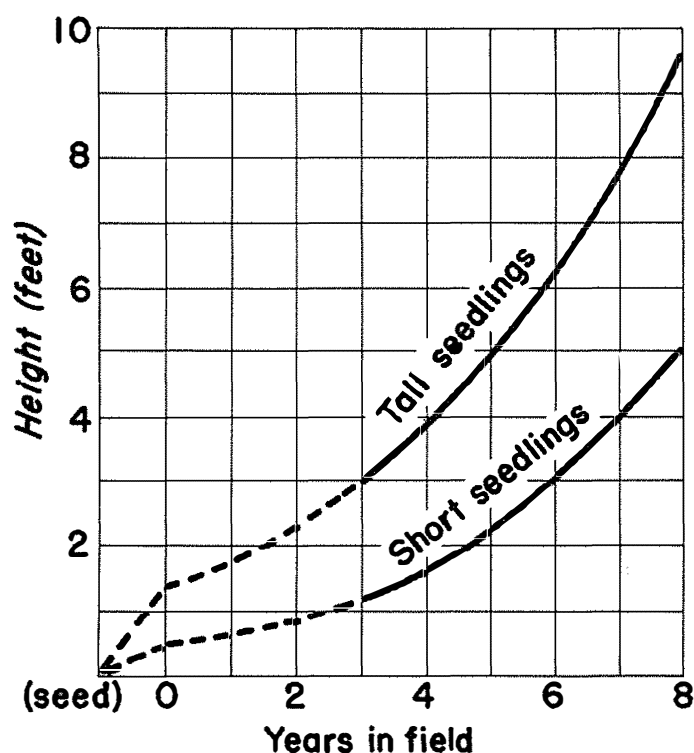


FIGURE 1.--Height growth of "short" and "tall" yellow-poplar seedlings.

Conclusions

The advantages of yellow-poplar planting stock grading are well known and results from this study confirm previous reports. For instance, Limstrom, Finn, and Deitschman found that second-year survival of yellow-poplar in old-field plantations in Ohio, Indiana, and Illinois averaged only 47 percent for seedlings with 3/20-inch-stem caliper but 77 to 93 percent for seedlings with 4/20-inch to 7/20-inch caliper.^{2/} Similarly, Rodenbach and Olson concluded that yellow-poplar seedlings less than 4/20-inch diameter at the root collar were not acceptable for planting in the Piedmont of North Carolina while those in the 4/20-inch class were marginal.^{3/} Finally, Lovin's results in North Carolina closely parallel ours: He found that first-year survival, height growth, and diameter growth of yellow-poplar seedlings with 1.2-foot tops were significantly greater than for 0.8-foot seedlings.^{4/}

By extending the study period another 5 to 7 years, we have found that the influence of seedling size extends well beyond the establishment period. Our findings are verified by later measurements of the plantations described in Limstrom, Finn, and Deitschman's paper.^{2/} After 10 years, the distinct inferiority of the 3/20-inch seedlings is still very apparent in their Ohio old-field plantation. Survival of the 3/20-inch seedlings averaged 78 percent while survival of the 4/20-inch to 7/20-inch seedlings ranged from 92 to 96 percent. The 3/20-inch seedlings had grown to be only 8.8 feet tall after 10 years while seedlings in the four larger caliper classes averaged 12.9 to 15.4 feet tall.

^{2/} Limstrom, G. A., Finn, R. F., and Deitschman, G. H. Planting stock grades for yellow-poplar. Jour. Forestry 53: 28-32, illus. 1955.

^{3/} Rodenbach, Richard C., and Olson, David F., Jr. Grading yellow-poplar planting stock is important. U.S. Forest Serv. Southeast. Forest Expt. Sta. Res. Note 147, 2 pp. 1960.

^{4/} Lovin, Henry Grady, Jr. Early survival, growth and development of yellow-poplar and loblolly pine planted seedling in the Lower Piedmont with special emphasis on morphological grades and fertilizers. 1959. (Master's thesis, N. C. State Col., Raleigh. 61 pp., illus.)

Greater early mortality of the short seedlings obviously results in reduced total volume growth until the plantations reach full stocking, probably 10 or more years from now. But we did not expect the strong relation between short planting stock and slow height growth to last as long as it has. During the first few years after planting, competition alone might have caused much of the difference. Our short seedlings needed at least 3 extra years just to get above the weeds. This longer period of intense competition undoubtedly reduced growth and killed more seedlings. But 4 years after short seedlings outgrew weeds, they still show no indication of catching up to tall seedlings and may be falling further behind.

Limstrom and Finn^{5/} found that seedling density in the nursery seedbed greatly influenced stem diameter, but had little or no effect on seedling height. Although some seedlings were short at the end of the summer because they germinated late, nearly half the short seedlings had germinated as early in the spring as tall seedlings. Apparently, this reflects differences in genetic capability for rapid growth. Since tall seedlings in this study were also larger in caliper on the average, their lasting superiority over short seedlings seems due to both favorable environment in the seedbed and inherently faster growth. At any rate the premium seedlings have consistently increased their original advantage during 8 years and show promise of maintaining it for some time.

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in cooperation with Ohio University)

^{5/} Limstrom, Gustaf A., and Finn, Raymond F. Seed source and nursery effects on yellow-poplar plantations. Jour. Forestry 54: 828-831, illus. 1956.